

Cohen, (J. Solis)

*Extracts from an Address on the Treatment of Affections  
of the Respiratory Passages and of Blood Poisonings,  
by Gaseous Enemata. By J. Solis-Cohen, M.D.*

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THE principle upon which the treatment is based is that the disastrous results of pulmonary tuberculosis are due to septicæmia set up by absorption of the noxious products of suppuration in ulcerous lesions in contact with the atmospheric air; and that repeated prolonged bathings of the suppurating surfaces with a safe antiseptic agent controls the suppuration and gives the lesions an opportunity to undergo cicatrization. When an attempt is made to administer such an agent by inhalation, the quantity required to produce the desired effect is so large that it is poisonous to the individual. The same may be said of administrations by the stomach, or by the subcutaneous connective tissue. Dr. Bergeon, reasoning on some experiments reported by Claude Bernard in 1857,<sup>1</sup> has found that certain antiseptic agents, of which he has found hydrogen sulphide the best, can be administered in sufficient quantities by the rectum with impunity, provided that care is taken not to introduce too much at a time. Claude Bernard demonstrated that when a toxic or medicinal agent is introduced into an organ at a distance from the arterial system,—the digestive tube, for example,—it could not penetrate into the arterial system because it becomes eliminated before it can reach that system. It has to traverse the portal system, the liver, the hepatic veins, and the pulmonary tissue; during which transit it may be eliminated in the liver by the bile, or, if volatile, in the lungs by exhalation. To demonstrate this point, Bernard rapidly poisoned a bird by enclosing it in a bell glass containing hydrogen sulphide; and then he injected a syringeful of the gas into the veins of a dog with impunity, and, with like impunity, a solution saturated with hydrogen sulphide into the rectum of a dog. In both these instances the gas was detected in elimination within a few seconds by blackening a paper saturated with plumbic acetate and held before the muzzle of the animal, and elimination had ceased at the end of five minutes. Hence he came to the conclusion that this substance could be safely introduced into the digestive tube or into the veins, provided care be taken not to introduce too great a quantity at a time.

The first experiments of Dr. Bergeon were made on animals with chlorine, turpentine, ether, ammonia, and bromine; but these agents had to be abandoned because they soon produced a violent inflammation of the rectum, and even points of sphacelus in the mucous membrane. On the other hand, a mixture of carbon dioxide and sulphuretted hydrogen was thoroughly tolerated when these two gases were pure and completely deprived of admixture with atmospheric air. In their union, the carbon dioxide plays somewhat the part of an inert agent, and attenuates the irritant properties of the hydrogen sulphide. Sulphur is well known as a powerful microbicide long recommended in pulmonary disease. Carbonic acid gas is likewise rapidly absorbed by the venous system, and rapidly eliminated by the lungs, provided it is injected slowly and in small quantity. The good effects of carbonic acid gas in pulmonary phthisis, in asthma, and in other affections, have long been known to the profession, as I had occasion to refer to it some twenty years ago in the first edition of my little "Treatise on Inhalation," and in which I referred, likewise, to some experiments made by Dr. James Collins and myself. In addition to this, the anæsthetic effect of carbonic acid gas may have some influence in preventing colic of the intestine in the introduction of the gas, and in subduing irritation in the pulmonary tract in its elimination.

Dr. Morel's apparatus for administering gaseous enemata is based on the principle that a current of carbon dioxide passing over certain gaseous or volatile substances produces a

<sup>1</sup> Leçons sur les substances toxiques et médicamenteuses.

disassociation of the gaseous elements, and drives them forward with it. It is necessary to produce a pure carbon dioxide; and then to pass it through a medicated liquid or over a volatile substance, and to force this gaseous combination into the intestine without permitting any reflux into the reservoir of carbon dioxide.

The carbon dioxide is prepared by dropping a solution of dilute sulphuric acid (200 grammes of sulphuric acid to the litre of water) on sodium bicarbonate. Chlorohydric acid was used in the earlier experiments; but a portion always escaped with the carbon dioxide, and produced irritation of the rectum and kidneys.

The apparatus for generating the carbon dioxide (Fig. 1) consists of a bottle in which three tablespoonfuls of sodium bicarbonate are placed. The bottle is hermetically

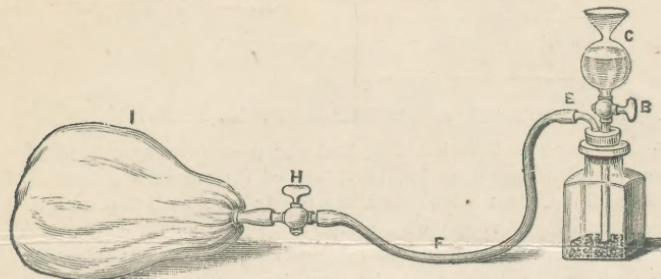


FIG. 1.

Carbon dioxide generator and reservoir.

closed by a rubber cork with two apertures, through one of which a glass tube extends to the bottom of the bottle, the upper portion (C) being expanded into a funnel and reservoir for the dilute sulphuric acid, beneath which is a glass stopcock (B) to regulate the descent of the liquid. The second

aperture in the cork is filled with a curved glass tube (E) for the escape of the gas; and this exit tube is prolonged by a section of rubber tubing (F) for attachment to a rubber bag (I) of six litres capacity, in which the carbonic acid gas is to be collected. The mouth of this bag is furnished with a stopcock (H). The sodium bicarbonate being placed in the bottle, the cork is inserted, and the stopcock of the sulphuric acid reservoir is closed. This reservoir is then filled with the dilute sulphuric acid, say four ounces, and the stopcock is turned so as to allow the acid to drip on the soda. The carbonic acid gas is evolved immediately, the activity of the disengagement being controlled by the stopcock. A little gas is allowed to escape into the atmosphere, so as to drive off the atmospheric air in the bottle. Meanwhile the reservoir is rolled tightly so as to drive out all the air it contains, as far as possible, and is then attached to the exit tube for the gas, and allowed to become filled with the carbonic acid. It is then removed, and its stopcock is closed. It must be removed before the stopcock is turned, in order that pent-up gas in the bottle shall not break the apparatus. This is one of the points to which the physician must direct the attention of his nurse, before intrusting the patient to the attendant. Another point upon which stress must be distinctly laid is the rolling of the bag to prevent retention of atmospheric air.

The gas is now ready for use. The reservoir (I) is attached to a handball aspirator (J) with check valves at each end (Fig. 2). This is attached to a metallic T tube (D) passing through a cork which is intended to be placed in the neck of a bottle containing the medicated solution, preferably a highly charged natural sulphur water. The vertical portion of the tube \*\*\* contains an orifice at top for the escape of the gas into the distal horizontal branch, to which is attached a tube (L) connected with a nozzle (N) for introduction into the rectum. This T branch is placed in a bottle three-fourths filled with the sulphurous water, and the aspirator is worked two or three times to drive out the atmospheric air in the bottle, another point to which the physician must emphatically direct the attention of his nurse. The nozzle is then inserted into the rectum of the recumbent patient, and the injection made slowly. All clothing must be loose. With the hand on the abdomen, the amount of distention of the colon is noted; and when this is

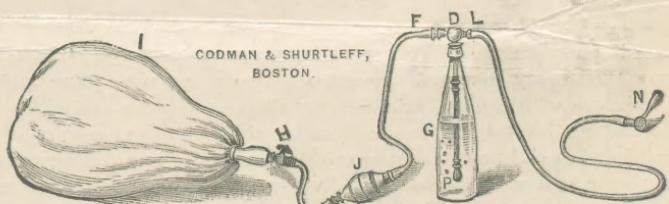


FIG. 2.

marked, or when pain is complained of, the process is suspended until absorption takes place, as manifested by relaxation of the tension; and then the process is resumed. Fifteen to twenty minutes are consumed in the process of driving the six litres of carbon dioxide through the sulphur water. The sulphur salt, e.g., sodium sulphide, is decomposed, hydrogen sulphide being formed, a portion of the carbon dioxide taken up to form sodium carbonates.

The only modification of the process I have permitted myself (for I deem it due, in justice to Dr. Burgeon and Dr. Morel, to test their method of administering the gas in their own way) is to place the mineral water bottle in a bath of warm water, which renders the injection more grateful. Within four minutes, sometimes within one, the sulphuretted hydrogen can be perceived in the breath, and be detected by paper saturated with plumbic acetate. It is prudent to have a bed-pan at hand, in case there should be a call to stool. The injection should not be made upon the full stomach. This may produce emesis, it is said. You want all the room possible in the abdomen to prevent pressure upon a distended stomach and upon the diaphragm.

Three or four hours after a meal, or just before one, is the best time for injection. Two injections are given daily. I have found three hours after breakfast, and three hours after supper the best periods. My patients have slept better after an injection just before bedtime, than after one three or four hours after the midday meal.

At the first injections, but half the contents of the reservoir of carbonic acid should be used, so that the parts and the system may be gradually accustomed to the process.

If the bottle of sulphurous water remain strongly impregnated after the injection, it may be tightly corked for use a second time. It is not necessary to have the bowels moved before an injection. Hæmoptysis and the presence of the menstrual period do not contraindicate the process. Indeed, Dr. Bergeon has seen amenorrhœa relieved during this treatment, even when that condition had failed to yield to the ordinary methods of treatment for that special condition.

When the pulmonary lesions are extensive, and, in consequence, elimination of the gas takes place slowly, the injections must be made very slowly, or they will produce sensations of fulness in the thorax and in the abdomen.

Now, as to therapeutic results. All published observations recount rapid amelioration of the suppurative phenomena; a marked diminution in cough, expectoration, dyspnoea, and night-sweats being noted within two or three days. Similar prompt improvement, with reduction of temperature, has been noted in some of my own cases, not in all. Some of his more than two hundred patients Dr. Bergeon considers cured. These, he states, no longer expectorate, and present no other stethoscopic evidences than the dry sounds due to cicatrized or cicatrizing cavities, or to cicatricial bands consecutive to old lesions. Some of them have been able to resume laborious occupations, and to ascend several flights of stairs many times a day without injury to their respiratory apparatus, or loss of the ameliorated condition which had been secured. Some who considered themselves cured at the end of a few weeks abandoned treatment, despite the advice of Dr. Bergeon, and underwent recurrence. It is, therefore, important that the treatment should be continued for some months, until all the pulmonary lesions have been cured, lest incompletely cicatrized surfaces undergo suppuration afresh, and reproduce septicæmia. They should be renewed from time to time, even after apparent cure, and especially upon any re-appearance of cough, expectoration, fever, or emaciation.

Not only are pulmonary lesions said to be cured by these enemata, but pharyngeal and laryngeal tuberculous ulcerations are said to undergo cure likewise, and that without any topical applications whatever,—simply from the contact of the gas in its elimination from the lungs.

In addition to pulmonary phthisis, the following diseases are said to be usefully treated by this method, the therapeutic principle being the same in all of them: asthma, whooping-cough, bronchitis, pulmonary catarrh, typhoid fever, the eruptive fevers, puerperal fever, and general septicæmia. If this be true, the list can be extended, as stated by Dr. Morel. The gas acts on the mass of infected blood in the right cavities of the heart, and upon its entire transit through the ramifications of the pulmonary artery, so that the venous blood is disinfected in its course to the pulmonary alveoli, and re-enters the branches of the pulmonary veins in a purer condition.

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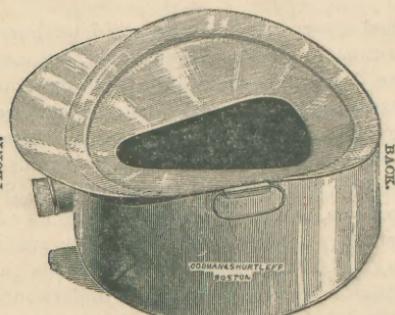
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